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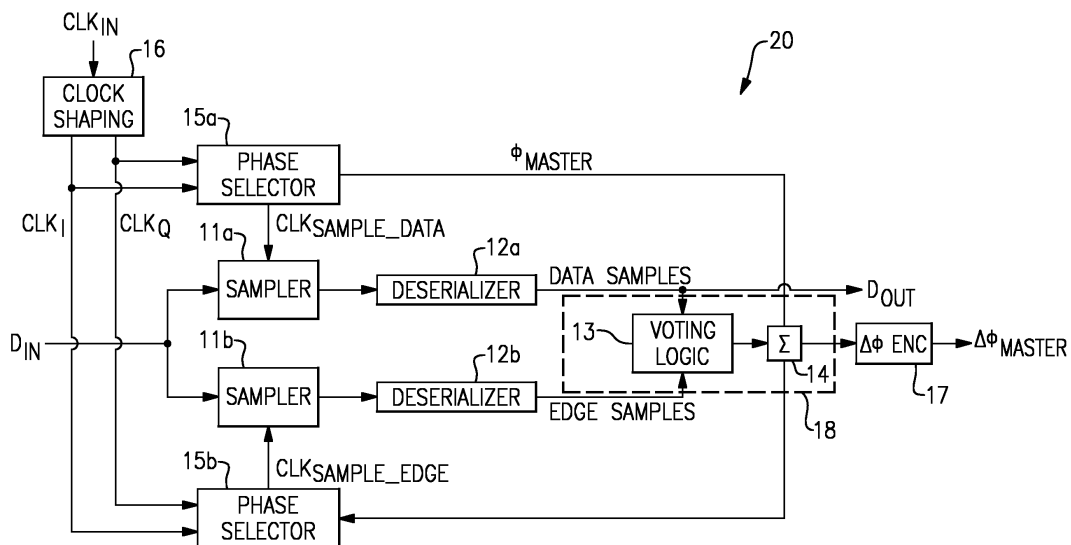
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(54) **APPARATUS AND METHODS FOR CLOCK AND DATA RECOVERY**

(57) Apparatus and methods for clock and data recovery (CDR) are provided herein. In certain configurations, a first CDR circuit captures data and edge samples from a first input data stream received over a first lane. The data and edge samples are used to generate a master phase signal, which is used to control a phase of a first data sampling clock signal used for capturing the data samples. Additionally, the first CDR circuit gener-

ates a master phase error signal based on changes to the master phase signal over time, and forwards the master phase error signal to at least a second CDR circuit. The second CDR circuit processes the master phase error signal to generate a slave phase signal used to control a phase of a second data sampling clock signal used for capturing data samples from a second input data stream received over a second lane.





EUROPEAN SEARCH REPORT

Application Number
EP 16 15 0636

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2006/224339 A1 (KIM DENNIS [US] ET AL) 5 October 2006 (2006-10-05)	1-6, 17-23	INV. H03L7/091
A	* paragraph [0003] * * paragraph [0027] * * paragraph [0030] - paragraph [0034] * * paragraph [0042] * * paragraph [0047] * * paragraph [0050] * * figures 5,8 *	7,9,10, 15	H04L7/033 H04L25/14
X	US 7 139 348 B1 (FU WEI [US] ET AL) 21 November 2006 (2006-11-21) * column 1, line 6 - column 2, line 10 * * column 2, line 56 - line 60 * * column 3, line 1 - line 26 * * column 4, line 29 - line 44 * * figure 2 *	1,22	
A	EP 1 067 742 A2 (TRW INC [US]) 10 January 2001 (2001-01-10) * paragraph [0006] - paragraph [0007] * * paragraph [0008] - paragraph [0009] * * paragraph [0011] * * paragraph [0018] - paragraph [0019] * * paragraph [0025] - paragraph [0027] * * figure 2 *	1-7,9, 10,15, 17-23	TECHNICAL FIELDS SEARCHED (IPC) H04L H03L
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 March 2016	Examiner Marongiu, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03/82 (P04C01)



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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-7, 9, 10, 15, 17-23

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION
SHEET B

Application Number

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-7, 9, 10, 15, 17-23

Clock and data recovery system comprising first a second CDR circuits. The first CDR circuit comprising a phase difference encoder configured to generate a master phase error signal by encoding a difference between a master phase signal and a delayed version of the master phase signal.

2. claims: 8-15, 17-21

Clock and data recovery system comprising first and second CDR circuits, wherein the second CDR circuit comprise: a phase control circuit including an accumulator and a phase determination circuit.

3. claims: 16-21, 24

Clock and data recovery system comprising first and second CDR circuits and two or more slave CDR circuits configured to pass or receive a token between one another and each slave CDR circuit is configured to update a local phase offset when the slave CDR circuit holds the token.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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23-03-2016

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